Appendix H

Repeat Rate Analysis

A. Techniques:

1. Different category schemes may be used to separate repeat films. For example, all the repeats should contain at a minimum according to cause:

   a. technique error
   b. positioning error
   c. motion
   d. darkroom error
   e. too light or too dark
   f. static
   g. cassette/mechanical problems
   h. waste
   i. others: (double exposure, inadequate information)

2. Alternatively, identification of the technician or level of training may be included. Table H-1 illustrates one classification system. If identified by name, take care to do the analysis in a non-threatening way. If a technician feels he/she will be singled out for repeat films, these films may never be found in the repeat film collection box because of the technician's fear of consequences. This may lead to delayed identification of needed areas for training and poor patient care.

B. Analysis

1. Once a system has been chosen to categorize repeat films and one person has been chosen to mark each film as to its category, the numbers obtained are recorded each day in the department log. At the end of a month, a QA representative analyzes the number of repeat films accumulated over the month as listed in the log.

C. Method

1. Find the total number of films taken. Most Navy Medical Treatment Facilities (MTF) are on a computer system which will record automatically the number of studies done that month as well as the average number of films/exam. This gives the total number of films taken if there is a zero repeat rate.

2. The repeat rate equals the number of repeat films divided by the total number of films taken during the month and is recorded as a percentage.

3. At most shore-based MTF's, the percentage is recorded and sent to Quality Improvement in the monthly QI report. Trend analysis is done graphically so comparison with previous months may be done. Also included are actions taken. Actions taken are based on probable causes, i.e., why is there a change in the repeat rate from last month.

4. The repeat rate should be less than 10%. Ten percent is an established norm nation-wide. As an aside, the repeat rate for mammography is between 2-5%. Many departments have succeeded in obtaining repeat rates much lower than 10%; the more detailed the quality assurance, the more likely that the average rate will be reduced.

D. Causes of fluctuation of repeat rate

1. Many factors contribute to the observed repeat rate. Included among these are:

   a. Changes in processor chemicals

   b. Changes in x-ray student classes working on the floor (Phase II students)

   c. Patient difficulty (e.g., acutely ill patients)

   d. Type of study, e.g., exotic studies (SI joints or mastoids, i.e., any exams not routinely done).

   e. Introduction of a new exam type. Processor maintenance - cleaning schedule, operating temperature, contaminants.

2. The most common problems are technique and positioning. For example, it is easy to clip an image. Also, proper technique for different size patients can be difficult to estimate and may lead to additional shots. Processor problems also are an important source of poor quality films requiring reshooting.

E. Advantages of controlling repeat rate at less than 10% or as low as possible:

a. Lower dose to patient.
b. Less film needed.
c. Less patient waiting time.

F. Example:

1. At a Naval Medical Center, there is a full-time QC technician responsible for the repeat rate analysis program. Films accidentally exposed to visible light are called waste films and not included in the analysis. Repeat films are called TU films (for technically unsatisfactory) and dropped into a centrally located box. The QC technician marks the film TU, why the film is TU and who made the film. Once a day (usually on the night shift), the films are sorted according to the categories in Table H-1 and the numbers recorded in the department log.

2. At the end of the month the QA representative or designee compiles the numbers and determines the total number of legitimate radiographs ordered during the month. This number is calculated from TRIRAD data covering film utilization.

3. The TRIRAD print-out is adjusted as follows: Exposures taken at Branch Medical Clinics are deleted from the total as are procedures involving digital recording, such as computed tomography, angiography, ultrasound, magnetic resonance imaging, nuclear medicine and radiation therapy. Mammography is calculated separately by the certified mammography tech.

4. The repeat analysis percentage may be calculated using spreadsheet software. Table H-2 is an example from a spreadsheet.

Table H-1

Technically Unsatisfactory (TU) Film Categories
(Sample)

Abbreviation	TU Film Category
Waste (W)	**Waste**
PTS	**Patient motion or lack of patient cooperation.**
TEC POST (TP)	**Staff technician positioning error.**
TEC TECH (TT)	**Staff technician technique error.**
SS POST (SSP)	**Senior student positioning error.**
SS TECH (SST)	**Senior student technique error.**
JS POST (JSP)	**Junior student positioning error.**
JS TECH (JST)	**Junior student technique error.**
OJT POST	**Positioning error by command trained personnel.**
OJT TECH	**Technique error by command trained personnel.**

Table H-2

Monthly Waste and Technically Unsatisfactory (TU) Rate (example)

DAY	WASTE	PTS	TEC POST	TEC TECH	SS POST	SS TECH	JS POST	JS TECH	OJT POST	OJT TECH
1	37	6	25	11	30	26	5	3	0	0
2	15	3	9	10	23	34	6	4	1	2
3	135	9	22	49	17	40	4	10	2	2
4	20	31	12	23	21	23	11	2	4	8
5	26	4	15	22	19	26	6	5	2	3
6	12	2	7	15	5	7	8	13	2	3
7	11	1	7	5	11	10	5	9	2	3
8	56	3	17	21	34	31	10	12	2	3
9	56	2	14	17	30	28	5	6	1	3
10	82	1	9	11	26	35	8	13	1	1
11	14	2	9	5	9	7	8	7	1	0
Day 11, day 12 etc. ↓ until the end of the month										
TOTAL	1120	104	378	431	542	543	97	101	18	40

Summary:

Total TU: 2254
Total Waste: 1120
Total Discard: 3374

Total Exposures ÷ Total TU = TU Rate
(25223 ÷ 2254 = 11.99)

1. Patient TU's are not counted in the Total Waste or TU rate.
2. Total exposures are calculated from TRIRAD "FM Option 1", deleting CT, AN, US, MR, RT, and CL.
3. With a good quality control program in place, poor radiographs may no longer be vaguely attributed to electrical line surges, unpredictable processors and the darkroom technician.